REMARKS

With this Amendment, claims 1-5, 7-18, and 20-52 are pending. Claims 1-40 are rejected. The Applicant is canceling claims 6 and 19.

Drawings

The drawings are objected to under 37 CFR 1.83(a) by the Office Action. The Office Action alleges the "the multiple chosen, fixed input beams and multiple desired main beams, claimed in claims 2 and 7 must be shown or the feature(s) canceled from the claim(s)." The Applicant is amending Figure 1 (as shown as an annotated marked-up drawing), to incorporate subject material included in the specification as originally filed, in order to show the features of claims 2 and 7. (The replacement sheet is included with this paper.) The Applicant has labeled outputs from blocks 16 as B_1, B_2, and B_N . The specification, as originally filed, discloses (Page 11, lines 5-7):

> The signals D are then converted to a set of signals which are post-processed by post-processing blocks/filters 16 to produce output beamformer signals B_1, B_2... B_N.

The specification further discloses (Page 11, line 23 – page 12, line 6.):

> In order to weight each portion of signal from each output beam B_N, an attenuation coefficient a_N is provided (typically on the order of 0.00 to 0.20, though not necessarily) for output beams 1 to N. The beams can be denoted as B_X for desired beams from 1 to X. The beam B_X follows the equation $B_X = \Sigma\, a_N B_N$. This equation is a summation that occurs in block 20. This crosstalk cancellation results in the desired lobes or beams as signals, represented by M in Fig. 2, which are then summed to produce the output signal $\underline{O}$. The output signal $\underline{O}$ follows the equation $\underline{O} = \Sigma B_X$.

Output $\underline{O}$ may comprise a plurality of desired output beams. As disclosed in the specification (page 11, lines 13-17), algorithmic block 20 may include amplifiers/weighing coefficients and an algorithm, and may form one or a plurality of desired output beams from output beamformer signals (e.g., B_1, B_2, and B_N corresponding to fixed input beams). As stated in 37 C.F.R. 1.83(a)

(Emphasis added.):

> The drawing in a nonprovisional application must show every feature of the invention specified in the claims. However, conventional features disclosed in the description and claims, where their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol or a labeled representation **(e.g., a labeled rectangular box)**.

Figure 1 illustrates algorithmic block 20 as a labeled rectangular box and thus properly shows the feature of "multiple chosen, fixed input beams, wherein the algorithmic block produces a plurality of desired output beams, and wherein the output signal comprises a plurality of desired output beams having a desired beamwidth" as included in claim 2 and the feature of "wherein the algorithmic block produces narrowed on-axis beamwidths for multiple desired main beams, and wherein the algorithmic block sums the beamformer outputs for the multiple desired resulting beams, and wherein the output signal comprises the beamformer outputs for the multiple desired resulting narrowed beams" as included in claim 7. No new subject matter has been included in the present patent application as originally filed.

The Applicant is amending Sheet 4 and Sheet 5 (as attached to this paper) to interchange the labels "Fig. 6" and "Fig. 7". As described in the Brief Description of the Drawings of the present patent application, as originally filed, Fig. 6 is a "polar plot of various frequencies signals **processed** by the present invention" and Fig. 7 is a "polar plot of various frequencies signals **unprocessed** by the present invention". (Emphasis added.) As amended, Fig. 6 corresponds to the processed signals associated with the unprocessed signals as shown for Fig. 5, and Fig. 8 corresponds to the processed signals associated with the unprocessed signals as shown in Fig. 7. In accordance with the present invention, the beam of the processed signals is narrower than the beam of the unprocessed signals. For example, the present specification, as originally filed, discloses (Page 20, lines 2-8):

> In the lobed beams of Fig. 6, the spatial representations of the lobes are more defined and narrower. Similarly, the sidelobes (off-axis pickup lobes) of Fig. 5 have become smaller (narrower) in Fig. 6.
>
> Figs. 7 and 8 represent signals with frequencies of 2500, 2800, 3200, 3600, 4000, 4400, and 4700, without and with cross-talk cancellation, respectively. Similar to Figs. 5 and 6, Figs. 7 and 8 illustrate a narrowing and greater definition of the beam by utilizing cross-talk cancellation in accordance with the techniques of the present invention.

Interchanging the labels of Sheet 4 and Sheet 5 is necessary to maintain this relative beamwidth relationship between processed and unprocessed signals.

Specification

The Applicant has deleted superfluous material in the Background of the Invention. Consequently, no material that is relevant to the invention has been deleted.

Claim Rejections – 35 U.S.C. § 102

Claims 1, 3-6, 8, 9, 14-16, 18, 23, and 24 are rejected by the Office Action under U.S. 102(e) as being anticipated by U.S. 6,748,086 (Venkatesh). Regarding claim 1, the Applicant has amended claim to include the features of claim 6. (Claim 6 is cancelled in this paper.) Thus, claim 1 includes the "an algorithmic block producing a desired resulting output beam having a narrowed on-axis beamwidth, wherein the narrowed on-axis beamwidth of the desired resulting output beam is produced by **superpositioning a desired main beam with a beam steered at an angle from the axis of the desired main beam**." (Emphasis added.) Regarding the features of claim 6, the Office Action alleges that Venkatesh (referring to FIG. 6) teaches "weights 62, summer 64 are used to create signals that point nulls in the direction of B, C and D which effectively narrow beam A when superimposed by summer 66." While summer 64 appears to merely create nulls in array 18 when superimposed by summer 66, Venkatesh fails to teach or even suggest "superpositioning a desired main beam <u>with</u> a beam steered at an angle from the axis of the desired main beam." Moreover, claims 3-5, 8, and 9 depend from claim 1, claims 3-5, 8, and 9 are not anticipated for at least the above reasons. Thus, the Applicant requests reconsideration of claims 1, 3-5, 8, and 9.

Regarding claim 14, the Applicant has amended the claim to include the features of claim 19. Thus, claim 14 includes the features of "narrowing the width of the desired beam of the desired signal, comprising: producing a cancellation beam; steering a central axis of the cancellation beam with or by phase shifts specified by a desired resulting beamwidth of the narrowed desired beam; and subtracting the cancellation beam from the desired main beam via superpositioning." (Emphasis added.) Regarding the features of claim 19, the Office Action does not provide any discussion of Venkatesh but alleges that US 6,594,367 (Marash) teaches "the

delay lines 34, filters 36 and convolvers 38 produce a plurality of cancellation beams which are superimposed with the main beam at summer 42." (Page 4, item 4.) While Marash appears to form a desired main beam by beamformer 30 in FIG. 2, Marash does not disclose any additional beamformers to form cancellation beams. Thus, Marash does not teach the feature of "producing a cancellation beam". Moreover, even if Marash were to teach the feature of "producing a cancellation beam", Marash does not teach or even suggest the feature of "**steering a central axis of the cancellation beam** with or by phase shifts specified by a desired resulting beamwidth of the narrowed desired beam". (Emphasis added.) The Office Action admits that "The noise is determined **since the beam filters are fixed**" where beam filters comprise delay line 34, filter 36 and convolver 38, summer 40 and summer 42. (Emphasis added. Page 4, item 4.) Also, Marash does not disclose or even suggest reference channel processor 32 (as shown in FIG. 2) steering a beam. Because claims 15-16, 18, 23, and 24 ultimately depend from claim 14, claims 15-16, 18, 23, and 24 are not anticipated for at least the above reasons. Thus, the Applicant requests reconsideration of claims 14-16, 18, 23, and 24.

Claims 14, 19, 20, 25-30, and 36-39 are rejected by the Office Action under 35 U.S.C. 102(b) as being anticipated by Marash. As discussed above, the Applicant has amended claim 14 to include the features of claim 19 and has consequently cancelled claim 19. Moreover, the Applicant has amended claim 20 to depend from claim 14 and is not anticipated by Marash for at least the above reasons. Thus, the Applicant is requesting reconsideration of claims 14 and 20.

Regarding claim 25, the claim includes the features "determining a desired resulting beamwidth of a desired resulting beam." For example, the present specification discloses (Page 13, lines 7-20. Emphasis added.):

> The main beam M initially has a beamwidth β on a polar representation. The beamwidth β may or may not be known. The width of the main beam is generally known by either simulation or measurement. The widths of the cancellation beams may be determined by simulation or experiment. The resulting beamwidth is a function of the angle and amplitude coefficient of the cancellation beams - and therefore the amount of overlap. This may or may not be determined in advance by simulation or measurement. This may be determined by empirical measurement of the directivity pattern of the system. The beamwidth β is assumed to contain a desired signal accompanied by undesirable noise along its edges (here, all unwanted signals are considered noise). It is further assumed that the elimination of undesirable/interfering signals produces the resulting beam with a beamwidth β'. **A desired resulting beamwidth β' may be calculated in**

> **advance** by simulation methods or "dialed in" on real time hardware by adjusting the amplitudes of the cancellation beamformer signals (weighting of cancellation beam output signals).

Referring to FIG. 2 of Marash, the Office Action alleges that "The desired resulting beamwidth is determined by the estimated noise subtracted from the beam at summer 42." However, Marash merely teaches calculating the resulting bandwidth for a given circuit configuration shown in FIG. 2 after the circuit configuration is known. Claims 26-30, and 36-37 ultimately depend from claim 25 and are not anticipated for at least the above reasons. Thus, the Applicant requests for reconsideration of claims 25-30, and 36-37.

Claim 38 includes similar features as claim 14 (as amended with the features of claim 19). For example, claim 38 includes the features of "producing a cancellation beam", "steering the central axis of the cancellation beam a phase specified by the desired resulting beamwidth of the narrowed desired beam", and "subtracting the cancellation beam from the desired main beam via superpositioning." Claim 39 depends from claim 38. Thus, for at least the above reasons, claims 38-39 are not anticipated by Marash. The Applicant requests for reconsideration of claims 38-39.

Claim Rejections – 35 U.S.C. § 103

Claims 2, 7, 21, 22 are rejected by the Office Action as being unpatentable over Ventatesh. However, claims 2, 7, 20, and 22 ultimately depend from claims 1 and 14 and are patentable over Ventatesh for at least the above reasons.

Claims 10-13 are rejected by the Office Action under U.S.C. 103(c) as being unpatentable over Ventatesh in view of US 5,862,240 (Ohkubo). Claims 10-13 depend from claim 1. Moreover Ohkubo does not make up for deficiencies of Venkatesh. Thus, claims 10-13 are patentable over Ventatesh in view of Ohkubo. The Applicant requests reconsideration of claims 10-13.

Claim 17 is rejected by the Office Action under 35 U.S.C. 103(a) as being unpatentable over Venkatesh in view of Marash. However, claim 17 ultimately depends from claim 14, Because Marash does not make up for the deficiencies of Venkatesh, claim 17 is patentable. Thus, the Applicant requests reconsideration of claim 17.

Claims 31-33 are rejected by the Office Action as being unpatentable over Marash. However, claims 31-33 ultimately depend from claim 25 and are patentable for at least the above reasons. The Applicant requests reconsideration of claims 31-33.

Claims 34-35 are rejected by the Office Action as being unpatentable over Marash in view of Ohkubo. Claims 34-35 ultimately depend from claim 25. Moreover, Ohkubo does not make up for the deficiencies of Marash. Thus, the Applicant requests reconsideration of claims 34-35.

New Claims

The Applicant is adding claim 41, which is supported by the specification as originally filed. Claim 41 depends from claim 1 and is patentable for at least the above reasons.

The Applicant is adding claims 42-52, which are supported by the present patent application as originally filed. For example, Figures 5-8 disclose polar plot showing a plurality of beams, in which each beam corresponds to a frequency band. Also, the associated section of the specification discloses (Page 19, line 17- page 20, lines 8):

> Figs. 5-8 represent polar plotted data for a variety of frequencies, both with and without cross-talk cancellation, tested in an anechoic chamber, each major division of the plot representing 10 decibels. Fig. 5 depicts signals without cross-talk cancellation at frequencies of 400, 600, 800, 1000, 1200, 1600, 2000, 2400 Hz. Fig. 6 depicts the identical signals of Fig. 5 with cross-talk cancellation. Labeling each line as a particular frequency does not contribute to the understanding of the results of cross-talk cancellation. Accordingly, what should be noted about comparing Fig. 5 with Fig. 6 is that the lobed beams towards the center of the plot in Fig. 5 correspond to the same in the center of the plot in Fig. 6. In the lobed beams of Fig. 6, the spatial representations of the lobes are more defined and narrower. Similarly, the sidelobes (off-axis pickup lobes) of Fig. 5 have become smaller (narrower) in Fig. 6.
>
> Figs. 7 and 8 represent signals with frequencies of 2500, 2800, 3200, 3600, 4000, 4400, and 4700, without and with cross-talk cancellation, respectively. Similar to Figs. 5 and 6, Figs. 7 and 8 illustrate a narrowing and greater definition

of the beam by utilizing cross-talk cancellation in accordance with the techniques of the present invention.

Conclusions

All objections and rejections have been addressed. Hence, it is respectfully submitted that the present application is in condition for allowance, and a notice to that effect is earnestly solicited.

Respectfully submitted,

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FIG. 1

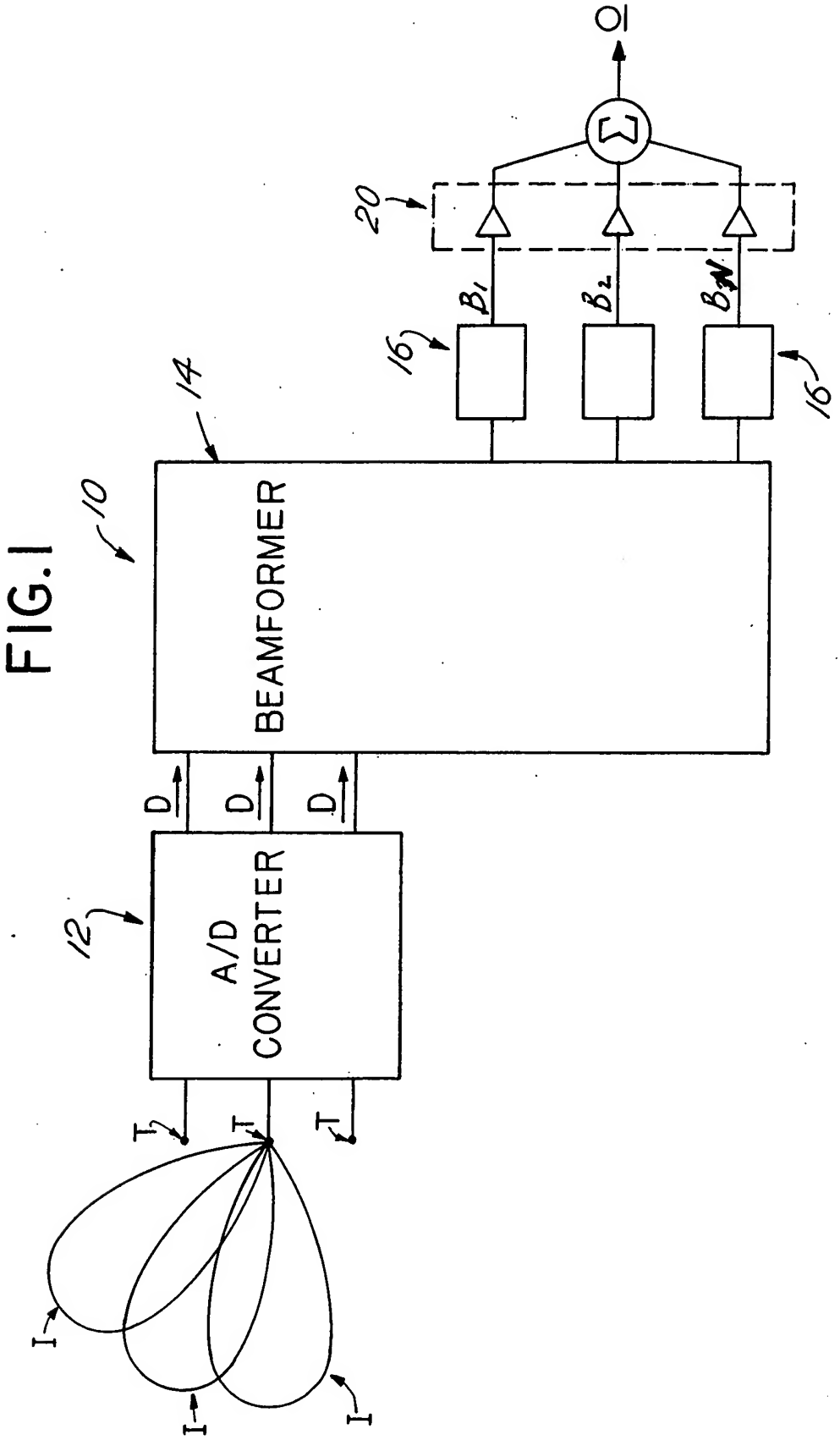

FIG. 6

~~FIG.7~~

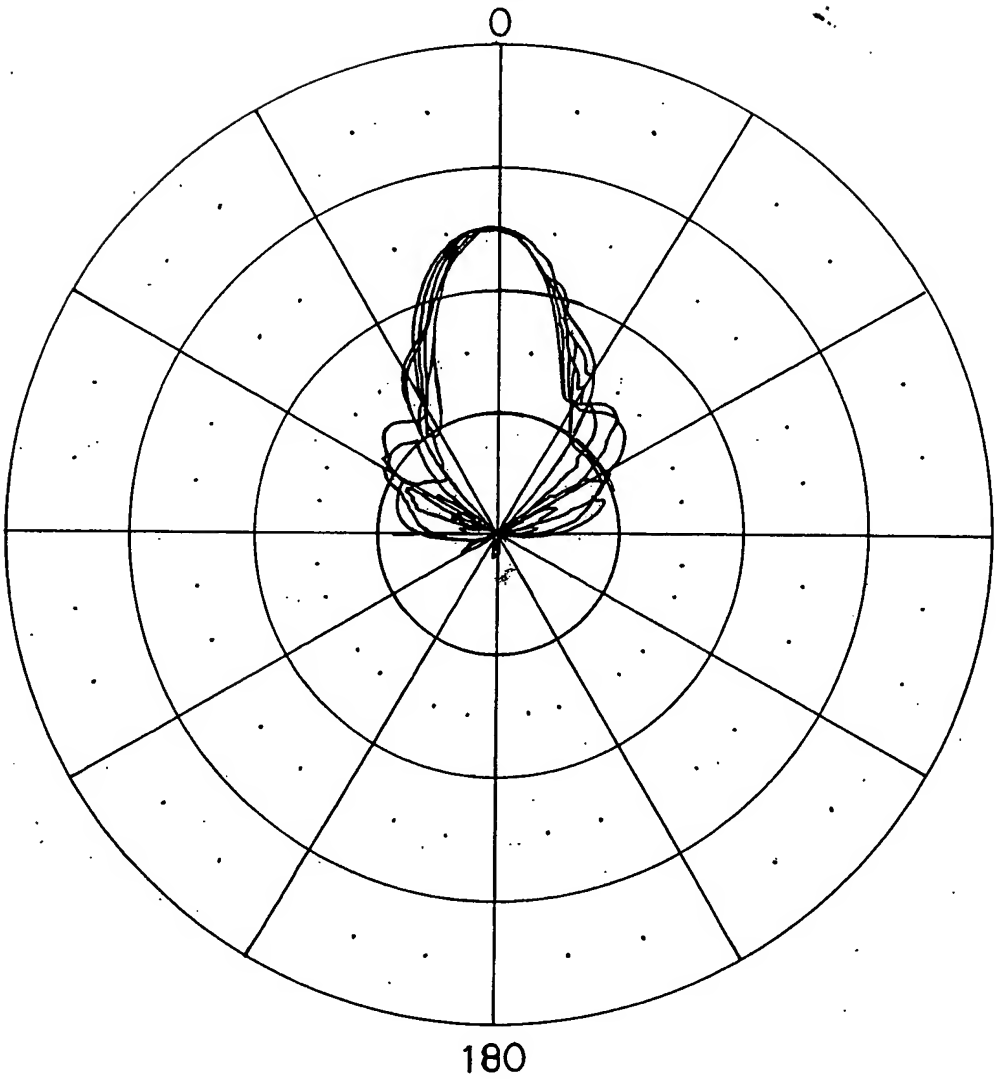

FIG. 7

~~FIG.6~~